

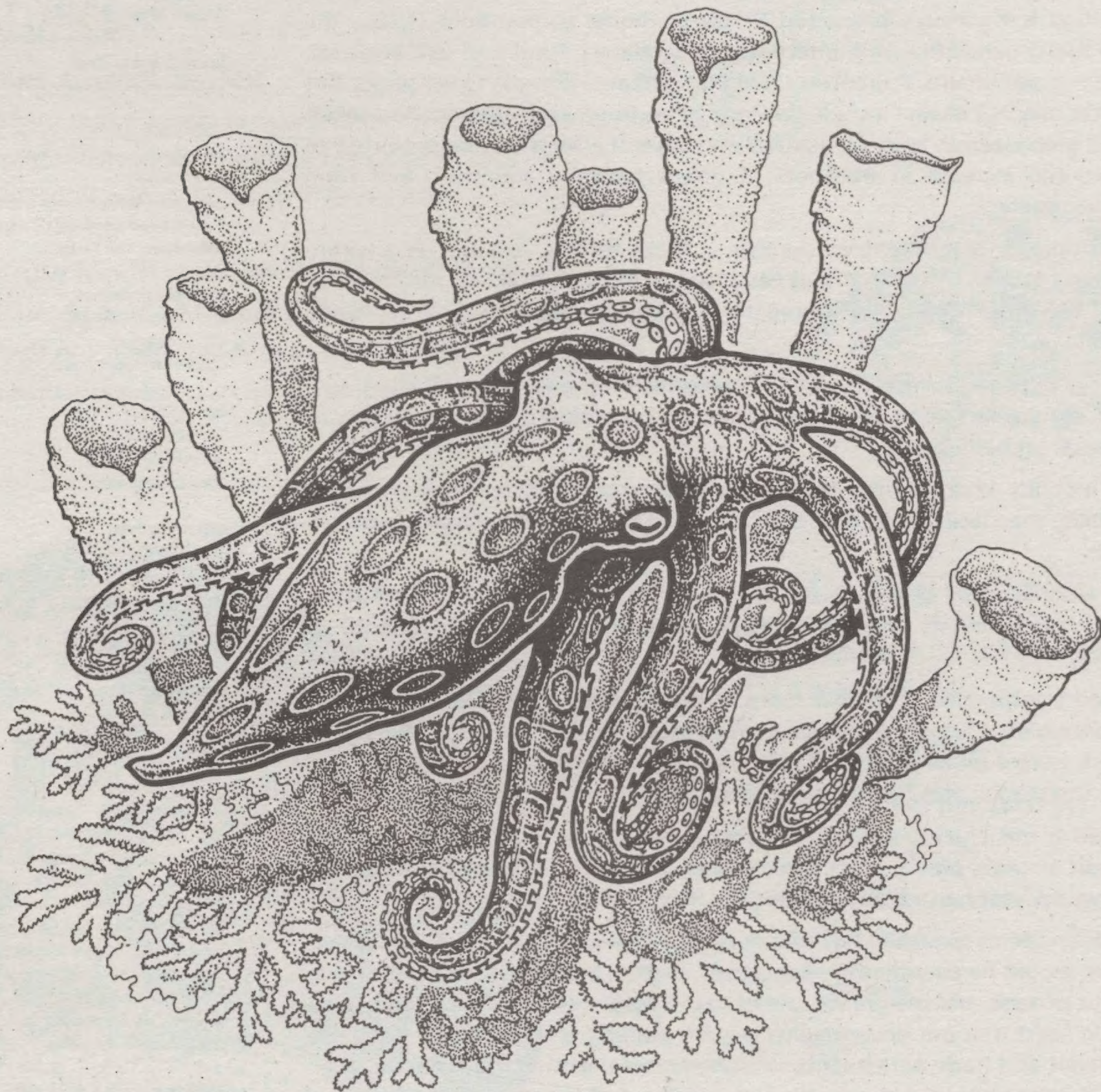
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Global biodiversity

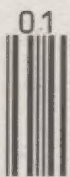
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MAPPING AUSTRALIA'S MARINE ECOSYSTEM



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EDITOR'S NOTEBOOK

Globalization and biodiversity

Globalization is vigorously promoted by transnational corporations (TNCs), the World Trade Organization, the International Monetary Fund and like agencies, and certain governments. Promoters claim that globalization will lower prices. But those prices may not always include the costs of environmental degradation. What effect will globalization have on biodiversity? Several effects may be predicted to flow from the increase in transport of goods between countries, and from changes in society.

- Competition for investment encourages a "Race for the Bottom" in environmental standards, an effect that is already seen in the standstill and rollback provisions of the draft Multilateral Agreement on Investment, and in "free" trade agreements.
- Greater genetic uniformity in globally marketed crop and domestic stock varieties will require increased use of pesticides and antibiotics with expected off-farm impacts on biodiversity
- Higher mobility of capital may generate a lowered sense of local environmental responsibility than local or national companies might have — the Distant Landlord Syndrome.
- As we globalize, the greater economic power of TNCs threatens to influence democratic governments on environmental issues — Corporatocracy instead of Democracy.
- Increased transport will generate more carbon dioxide, a greenhouse gas, that will enhance global warming and result in a cascade of effects on biodiversity. In 1991 there were 4 billion tonnes of ship transport requiring 8.1 exajoules of energy (more than Brazil and Turkey's energy usage).
- Increased plane, truck and ship transport increases the chance of introducing more exotic animals, plants, pests and diseases, impacting indigenous species and ecosystems. However, some foreign biocides may help counteract pests.

Globalization seems to portend a number of negative effects on biodiversity. As a society we should be considering alternatives, such as bioregionalism, reasserting democratic process, and the greater use of native biodiversity and local land races. We should insist that our governments require binding environmental standards in investment and trade agreements, or adherence to existing international environmental agreements such as the International Convention on Biological Diversity, the Montreal Protocol, and the Law of the Sea.

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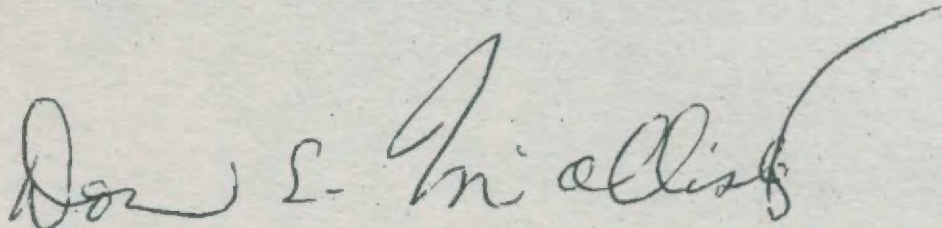
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Global biodiversity

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Canadian Museum of Nature researchers work all over the globe to further our understanding of biodiversity

Mark Graham, Canadian Museum of Nature



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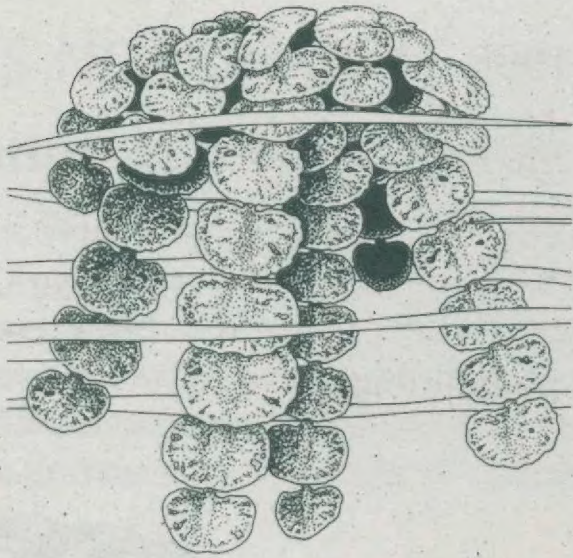
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Mapping a Great Big Sea

Australians make a leap forward in biodiversity management by building a complete map of their marine ecosystems

I. D. Cresswell and R. Thackway

Halimeda opunti
Illus.: Roelof Idema



Australia's oceans and coastline waters are awesome in their ecosystem diversity, rich in species, and nearly twice the size of Australia's terrestrial area. At present these waters are managed by six states and two territories, which have jurisdiction over the majority of inshore coastal waters, and the federal government, which has jurisdiction over 95% of the offshore waters. In 1994, Australia embarked on the project of finding a single ecologically-defined framework for managing all of its marine estate.

The development of an ecosystem-scale regionalisation of Australia's marine and coastal environments was identified as a major priority in developing a national representative system of marine protected areas (Thackway and McRae, 1995). A number of problems were raised at the first meeting in 1994, which was called to identify existing classifications and to develop a single, meso-scale regionalisation for Australia (Muldoon, 1995). This new integrated bioregional planning and management framework had to operate at all scales and be accepted by government, industry and the wider community. They had to bring together all the players, and they had to compile the data and information on Australia's marine biodiversity into a useable tool for decision-making.

An ecologically defined regionalisation would surely provide the first layer in such an ambitious and forward-looking planning framework. Unfortunately, key tools for research, conservation, resource management, and monitoring of hierarchical ecosystem classification systems are generally lacking at the national and regional scale and are entirely lacking at the global scale. The Australian approach was to derive provinces at the continental scale, and regions at the meso-scale. It then integrated the "coarser" offshore provinces with the "finer" inshore regions. The result is an ecosystem-based hierarchical classification of the marine environment [known as the Interim Marine and Coastal Regionalisation for Australia (IMCRA)] (IMCRA Technical Group, 1997).

The development of the IMCRA followed a procedure similar to that used to develop the Interim Biogeographic Regionalisation for Australia (IBRA), a terrestrial ecosystem-based regional planning framework (Thackway and Cresswell, 1995). Since its development, IBRA has been widely accepted and used for strategic planning and reporting ecological information at both the national and state level. Both IBRA and IMCRA were developed to assist in planning national systems of protected areas in accordance with several national environmental strategies, in particular the National Strategy for the Conservation of Biodiversity (Commonwealth of Australia, 1996).

METHOD The IMCRA integrates numerous existing regionalisations and coastal and marine information using a biogeographic approach. Technical and

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research specialists from state, Northern Territory, and federal government marine resource management and research agencies contributed knowledge and expertise in many forms (field knowledge, published resource and environmental reports, and existing regionalisations). Ecological knowledge was combined with regional and continental scale biophysical data sets and then interpreted to describe known biodiversity patterns. Where biodiversity knowledge was limited, physical oceanographic and topographic information was used.

Developing the regionalisations and integrating them into an agreed product took three years, from March 1994 until March 1997. The inshore regionalisation was initiated first, with the off-shore regionalisations being developed in the second half of the process. Frequent consultation between scientists at both the federal and state/territory levels was required to gain agreement on each iteration in the development of the IMCRA. This process involved circulation of discussion papers and technical reports, and various workshops.

The federal Department of Environment was instrumental in developing the IMCRA. It provided financial assistance to the various marine management and research agencies carrying out targeted biological surveys, strategic planning, and developing regionalisations for their respective jurisdictions. In addition, it coordinated the integration of the existing regionalisations and supporting scientific information into an ecologically defined regional planning framework. It also compiled the agreed-upon national regionalisations using the final regionalisations and metadata supplied by the various jurisdictions, and compiled and edited the supporting descriptive report (IMCRA Technical Group, 1997).

INSHORE WATERS A first draft regionalisation of the inshore waters (known as IMCRA version 1) was compiled in March 1995. Two approaches were used to select region boundaries:

1. Available regionalisation boundaries and descriptions

were interpreted, integrated and transferred onto paper maps and these boundaries were then digitised; and

2. Where local and sub-regional scale GIS data were available, these data/regions were aggregated to derive coarser meso-scale map unit boundaries and descriptions (IMCRA Technical Group, 1997).

When existing regionalisations stopped at state borders, the neighbouring regions were examined. If the same unit occurred across the borders, the regions were either joined or split at an appropriate ecological boundary to form new regions. Names and descriptions for each region adopted existing common location names and/or referenced source documents. Where no names or descriptions were available, specialist field knowledge was used to generate appropriate names and descriptions.

Following a workshop on IMCRA version 1, a report was written describing the approaches used by the respective state, Northern Territory and federal government agencies. This document was then comprehensively reviewed and revised by the participating marine resource management agencies. A second workshop was held in December 1995 and further revisions were made (IMCRA version 2).

OFFSHORE APPROACH There was a far greater lack of base data and knowledge about the offshore waters. Beginning in 1996, after the first inshore regionalisation had been produced but prior to that work being completed, three separate scientific analyses were undertaken. These analyses tried to synthesise the sparse data for the entire Australian Exclusive Economic Zone (EEZ) into a coherent integrated information system. This system could then be used to map and describe the ecological patterns and processes of both the inshore and offshore waters. Regionalisations were based on combining information about fish species composition and richness, physical oceanographic data (salinity, temperature, nitrate and silicate concentrations at various depth intervals), and sea floor topography and sediment type.

Box 1**Guidelines for Integrating the Inshore and Offshore Regionalisations**

- Use existing information and the consensus of specialists from a wide range of marine disciplines, in particular marine resource management agencies.
- Incorporate a hierarchical data structure whereby the largest or first-order regions coincide with those developed for the oceanic provinces and, where finer sub-divisions are homogenous areas called regions and units, respectively (see Thackway and Cresswell, 1995).
- Develop a set of guidelines for defining the desired scale, for drawing "firm" and "fuzzy" boundaries, and for splitting and lumping regions within the IMCRA.
- Ensure that each region is relatively homogenous, based on physical oceanography and biological attributes.
- Define the level of attributes required to describe each region.
- Give approximately equal weight to each of the attributes in the framework.
- Develop an agreed nomenclature for each of the regions in IMCRA, that is, common names and a look-up table to relate IMCRA names to existing state and territory and commonwealth region names and mapping codes.
- Where possible ensure that the total number of regions in the spatial framework does not exceed 100.
- Ensure that the boundary between the inshore and offshore waters is not based upon jurisdictional boundaries (for example, 3 or 12 nautical miles).
- In developing the IMCRA exclude the following Australian External Territories - Heard and MacDonald Islands, Christmas Island, Cocos and North Keeling Islands, and Antarctica.
- Following the integration establish a process of review and revision of region boundaries through peer review by specialist scientists (for example, managing agencies, tertiary and research institutions).

RESULTS The development of the IMCRA involved far more than a scientific classification and integration of biotic and abiotic data. It also involved a complex interaction on political and administrative levels between agencies and individuals who had not worked together previously. To ensure the maintenance of the scientific process in the future, a large effort was put into building up linkages and trust between agencies and individuals.

The IMCRA regionalisations provide a structured hierarchy of ecological information, from continental to site scale. The agreed hierarchical biogeographic terms which apply to IMCRA are Province, Region (meso-scale), Unit, and Site. The second tier in the meso-scale Regions are ascribed the term biogeographic regions. Due to the many commonalities found in the descriptions and boundaries of the state, Northern Territory and federal biogeographic regionalisations at the meso-scale, IMCRA afforded Australia the opportunity to derive consistent major regions that crossed State borders, giving truly integrated national coverage for the first time.

The inshore regionalisation comprises 60 regions, which generally form a continuous, narrow, segmented band around the continent to 200 metres water depth. The boundary between regions usually extends perpendicularly from the coast, though in shallow subtropical and tropical waters several parallel bands extend out from the coast.

Preliminary work at the provincial scale resulted in the development of two regionalisations: one for the sea bottom (demersal provinces and biotones) and one for the open sea (pelagic provinces and biotones) (see Maps 1 and 2 for details). Biotones are zones of transition between core provinces. The biotones identified are not simply "fuzzy" boundaries around a disjunction. On the contrary, many of them are at least as extensive, and in some cases are more extensive, than the adjoining core provinces. These biotones must be recognised as unique systems and managed with due recognition of the contributions made from core provinces. Work has already begun on integrating the demersal and pelagic regionalisations into a single provincial level regionalisation extending across the entire EEZ. It is proposed that revised provincial regionalisation will be incorporated into the next version of IMCRA.

Table 1 presents a summary of the regionalisation products developed by the inshore and offshore working groups. Box 1 describes the guidelines set down at the political level to direct the working groups in the integration of the inshore and offshore regionalisations.

REGIONALISATION PRODUCTS DEVELOPED BY THE INSHORE AND OFFSHORE WATERS WORKING GROUPS

Working Group	Spatial Coverage	Primary Scales	Primary Developers	Primary Regionalisations Considered in the Integration Process
Inshore	State and Northern Territory waters	Meso	State and Northern Territory jurisdictions	• IMCRA Version 2.0 biogeographic regionalisation
Offshore	Continental shelf and beyond the shelf break	Meso to provincial	Australian Geological Survey Organisation and Commonwealth Scientific and Industrial Research Organisation, Division of Wildlife and Ecology	• Sea floor topography • Sea floor sediments • Physical oceanographic water column • Coastal zone geomorphology
	Continental shelf	Provincial to meso	CSIRO Marine Laboratories	• Pelagic fish • Demersal fish
	Continental shelf and beyond the shelf break	Provincial	CSIRO Marine Laboratories	• Physical Oceanographic Water Column 0-50 m 150 m 800-1000 m

Table 1

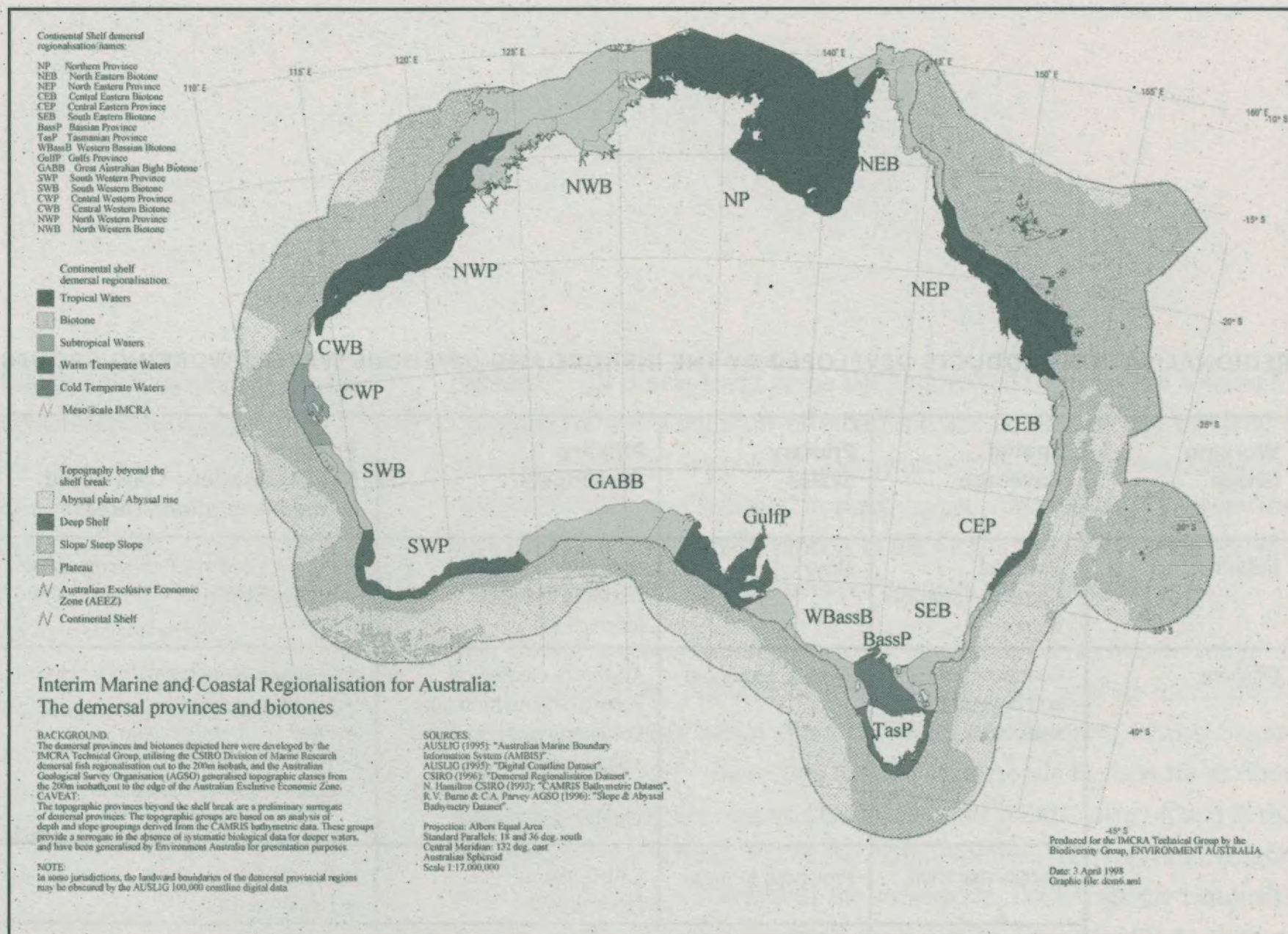
Just as important as the agreement on the regionalisations was the agreement on the 11 assumptions and caveats that apply to the uses of IMCRA (see Box 1) (IMCRA Technical Group, 1997). Terms and conditions of use were also provided, along with statements on the explicit responsibilities of the marine management and research agencies responsible for IMCRA and having custodianship of the IMCRA products.

DISCUSSION The development of a single biogeographic meso-scale regionalisation should not be regarded as an end point, but rather as an evolutionary process. As new information becomes available and new insights are gained the IMCRA regionalisations will be revised.

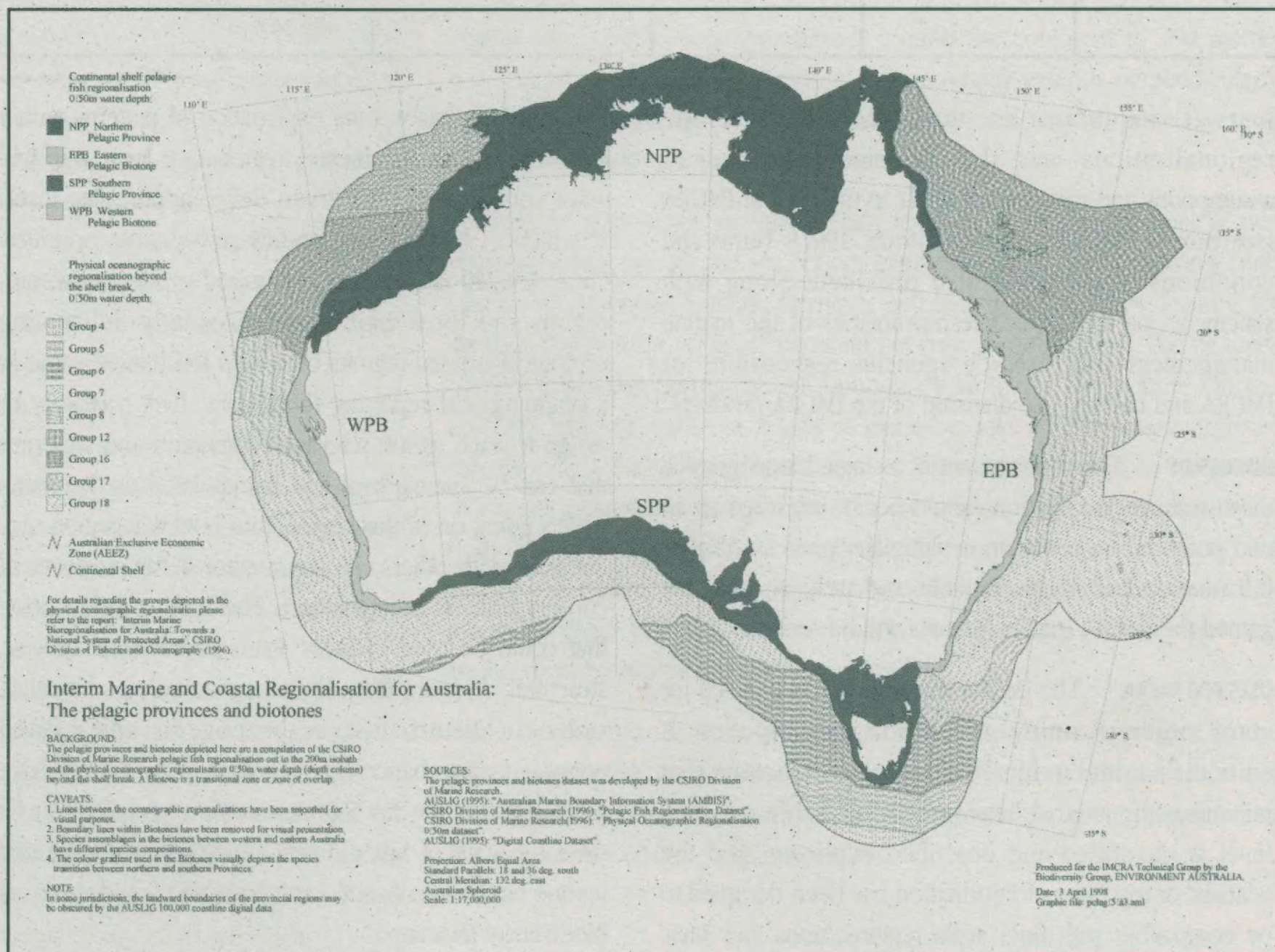
USES FOR IMCRA The IMCRA framework will be used for many other planning and reporting purposes. It embodies a hierarchical information structure that minimizes the internal heterogeneity at each level. Each level is quantified and described explicitly, and the coarsest or top layer of information has been designed to be compatible with finer scale regions, units and sites.

This structure enables the explanation of patterns within their context (i.e. continental, regional, or local) and will assist conservation planners to define appropriate levels at which to conduct assessments and allocate priorities. More detailed information is required to identify within-region and local-scale patterns. Simply delineating ecologically-based regions on a map has limited value as a planning and reporting framework. It is necessary to assign to each region relevant information and attributes that can be summarized and manipulated to determine what's going on in that region, and how that region may compare with others (i.e. to monitor it for purposes of conservation or management). The type of information that could be used includes status of keystone species, structural diversity (rugosity), fragmentation of habitat, sediment disturbance, anthropogenic and natural ecosystem disturbance/change. Ward et al. (1998) have proposed that the IMCRA meso-scale regionalisation be used for State of Environment reporting in coastal and marine environments and have proposed a wide array of biodiversity indicators.

Map 1
Interim Marine and Coastal Regionalisation for Australia: the demersal provinces and biotones



Map 2
Interim Marine and Coastal Regionalisation for Australia: the pelagic provinces and biotones



The development of the IMCRA involved a complex interaction on political and administrative levels between agencies and individuals who had not worked together previously.

The IMCRA was specifically developed as a planning framework for developing a national representative system of marine protected areas (MPAs) (see Thackway, 1996a). As such, it is an important step in the further development of the protected area system. MPAs perform an essential function in maintaining the marine ecosystem within the matrix of different human uses of the marine system (Kelleher et al., 1995). To assist decision makers with policy, regionalisation information on current protected areas and what they contain must be added. Then gaps can be identified and priorities set for delivery and evaluation of public programs to enhance the national representative system of marine protected areas (Thackway, 1998). True sustainable management of the marine environment relies on the development of an MPA system as part of a regional resource management framework (Sainsbury et al., 1997). Without a comprehensive understanding of regional scale ecosystems, it is not possible to identify and select representative systems of protected areas.

A suite of conservation planning attributes, which may be combined to identify broad gaps in the current system of protected areas and to set priorities for the national system of marine protected areas, are under consideration.

Potential conservation planning attributes include:

- the representativeness of regions in protected areas (a measure of the percentage of the area in each region reserved for conservation);
- the level of bias within protected areas (that is, how comprehensively the existing protected areas in each region sample the known environmental variation);
- ecosystem integrity (a measure of the health of each ecosystem type in each region);
- risks and limiting factors (for establishing a viable national representative system of marine protected areas); and
- alternative conservation planning and management

measures (for example statutory protection, planning instruments, and voluntary conservation agreements).

LIMITATIONS While the IMCRA may be used for broad identification of gaps in the protected area system, it is not an appropriate tool for site identification and selection. This must involve more detailed ecological information and other factors including social, cultural and economic values (Kelleher and Kenchington, 1992) not included in IMCRA (see Thackway, 1996b). Similarly, the IMCRA should not be used as the sole criterion for allocating priorities in the selection of areas for reservation. Nevertheless IMCRA is a useful tool and there is a need to extend it to a finer scale (See Thackway, 1998 for an application of IMCRA in planning an MPA in Commonwealth Waters of the Great Australia Bight.). It is likely that the IMCRA will be used for a wide range of other conservation and sustainable development applications by a variety of user groups including conservation researchers, planners, managers, community groups, and industry.

Before the IMCRA is used for any application it is advised that users appraise themselves of the assumptions and limitations specified by the developers. The onus rests with the users to apply the regionalisation appropriately when developing applied products.

CONCLUSIONS The IMCRA is an important tool for marine science and policy in Australia, providing a meaningful ecologically-based marine framework for field-based ecologists, planners, managers, and researchers. The word "interim" in its title emphasizes that it is a dynamic product, which will be regularly reviewed and revised in the light of new information.

The merits and utility of the IMCRA will continue to be assessed by technical specialists in resource management agencies who are responsible for reviewing, revising, value adding, and using the IMCRA products for conservation planning and management in the coastal and marine environments. It is hoped that this will lead

to broader policy support for the IMCRA within the resource managing agencies and their governing councils. The value of the IMCRA will also be measured by the wider community in how well it represents their understanding of an area, and how well it communicates information about that area to individuals and communities who live adjacent to, and/or use it for a range of activities.

Before the IMCRA can be widely used there is a need to further develop and validate the boundaries and region descriptions. Work is required to establish the next tier in the hierarchy (i.e. at the unit level). In addition, work is needed to refine the limitations and assumptions.

It is hoped that open access to the IMCRA will enable a more integrated approach to resource management in the Australian marine estate. Information linked to the IMCRA regions will lead to more informed and integrated resource management. One outcome will be an awareness of the need to manage these resources according to ecological principles. Another outcome will be a willingness to adapt management practices to achieve long term sustainable use and conservation of biodiversity. It is generally recognized that MPAs are an integral component of coastal and marine resource management, providing essential ecosystem maintenance in areas that are managed for multiple-use objectives. In order to achieve a viable system of MPAs, it will be necessary to understand and manage the impacts from surrounding marine and terrestrial areas.

Editor's Note:
Canadians may wish to take a look at British Columbia's results in developing a hierarchical marine classification system for its waters. Go to <http://www.gis.luco.gov.bc.ca/mec.htm>.

Finally, the IMCRA is not a static planning framework. New data and new ways of combining existing information will be enhanced by technological solutions such as improved access to decision-support tools. Technological advancements have already provided significant improvements in the areas of user-friendly interfaces to GIS and viewing of complex spatial linkages between hierarchies of data. The progressive incorporation of modelling and analytical tools into

marine biogeography will increasingly enhance the IMCRA. Further advances will make it possible for decision makers and stakeholders to view and analyse even greater amounts of data and information in three dimensions. This data can then be used to enhance the understanding and protection of Australia's rich and diverse marine regions.

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Exploring Biodiversity to the Ends of the Earth

Canadian Museum of Nature researchers work all over the globe to further our understanding of biodiversity

Mark Grabam, Canadian Museum of Nature

The Rideau River,
Ottawa, Ontario
Photo: Martha Johnson



In 1997 the Canadian Museum of Nature (CMN) celebrated its 85th year at the Victoria Memorial Museum Building in Ottawa — locally known as the “Castle”. Like any birthday celebration it was a time to reminisce, to take stock, and to think about the future. The CMN is proud being a multifaceted, national institute that has always had a foundation in field (collections), and laboratory-based research, with diversity as the theme.

In fact, the roots of those research activities are even older than the Castle: they lie in the Geological Survey of Canada that was formed well over a hundred years ago. Fortunately for biodiversity research activities today, the interests of those first extensive field surveys quickly expanded from the earth sciences to include botany and zoology. The legacy of this broadening is the magnificent collection of natural history specimens that are used extensively by researchers at the Museum, across Canada, and around the world.

Collections-based systematics research is the CMN's strength. Systematics research has a broad scope and includes studies that provide authoritative results on discovery, naming, and classification of species (nomenclature); distribution (biogeography); origin and evolution (speciation and adaptation); and the evolutionary or branching relationships among species (phylogeny or cladistics). The Museum currently supports three programs of systematics research: research into past diversity (Paleobiological Studies), research into the aspects of diversity of certain minerals (Rare Elements), and research into current diversity (Issues in Biodiversity).

As well as being collections-based and oriented towards systematics, CMN research also has a mandate to communicate its discoveries to the public. These three attributes set its research apart from that done in other institutions. The CMN, like all progressive natural history museums, has developed a strong program of public education venues. The Museum also has a strong publications program, with a scientific syllogeus series as well as popular works such as *The Birds of Canada* and the soon-to-be

published Lichens of North America, including permanent exhibits in Ottawa and smaller exhibits that travel the nation. The messages provided in those media, based on the collections and research of the Museum, popularize natural history issues, making them visible and understandable. This encourages informed decision making, whether it be by a politician constructing environmental policy, or by a family wanting to contribute to the conservation of a local pond.

The Museum setting also provides a significant training opportunity as Museum experts can involve post-secondary students in their research activities.

ISSUES IN BIODIVERSITY PROJECT What exactly do the nine research scientists, four assistants, and 14 research associates involved in the Issues in Biodiversity project study? The following is a survey of some of the 24 biodiversity research activities underway at the CMN. The name, a brief biography, and contact information for each scientist can be found at our web site, <http://www.nature.ca/english/resstaff.htm>

The results of all 24 activities have three general applications:

1. Understanding Biodiversity which includes systematics and evolution, basic research in the taxonomy and evolution of taxa, and ecology. Basic research on the interactions of taxa with each other and the environment, structure and dynamics of communities, and the results of environmental perturbations on natural populations.
2. Regional Studies of Biodiversity: Research that focuses on geographic regions, including studies of biogeography, rare and endangered species, and the production of baseline data for environmental impact assessments.
3. Conserving and Managing Biodiversity: Applying the results of basic research to investigate specific, practical problems in biodiversity, resulting in decisions and recommendations.

RIDEAU RIVER PROJECT, OTTAWA, ONTARIO The newest, and perhaps the most integrative research activity at the CMN, is the Rideau River study being led by Dr. Michel Poulin. Dr. Poulin will lead a team in the Issues in Biodiversity project that includes most of the CMN scientists, some CMN Research Associates, several government agencies at the municipal, provincial and federal levels, community groups and interested members of the public. They are studying flora and fauna along the river and will also perform water chemistry analysis. The inventory work has the benefit of several years of previously collected water quality data, and the project will attempt to further identify areas of concern and effective indicators of water quality, in light of significant human impact on the waterway. The program has been developed in close association with community groups along the Rideau River, and includes plans to maintain close contact with them in communicating the scientific findings, in gathering data, and in carrying out educational activities. So far, two community workshops have been held to collect local knowledge. There are also plans to involve local schools with curriculum-based activities on aquatic ecology in local schools.

ANTARCTIC MICROFLORA AND BENTHOS COMMUNITIES As well as leading the Rideau River activity, Dr. Poulin, a diatom expert, is also collaborating in systematic research on the marine microflora of the St. Lawrence estuary and the Antarctic.

The Antarctic is an enormous continent with important marine resources, a high level of biotic endemism, or richness, in unique species, and more than its share of ecological challenges, especially human-related stressors. Dr. Kathleen Conlan is a marine invertebrate specialist who is an integral team member of several National Scientific Foundation projects studying the marine biology of this southern reach. The general aim of these activities is to investigate the ecology of the benthos (the sea floor) in near-shore areas. Dr. Conlan's work includes surveying healthy and impacted areas, describing faunal

Collections-based systematics research is the CMN's strength.

assemblages (i.e. who lives in what neighborhood), studying who eats what, and how nutrients are assimilated into the food chain. The results of these studies can give us confidence in predicting the impact of humans in cold environments, and therefore, some ability to measure environmental health.

ARCTIC ICE SCOURS, GRASSES, AND DNA Dr. Conlan is one of the few Canadian biologists who regularly works in both polar regions. She is currently completing a study on the succession that occurs after icebergs act like bulldozers on the ocean floor in the Arctic. This study on extreme physical disturbance helps us understand how communities of marine life come together.

The CMN's long history of work in the Arctic is also continued through the efforts of Drs. Susan Aiken and Lynn Gillespie, the Museum's vascular plant experts. Dr. Aiken is leading an activity on the systematic treatment of the flora of the Arctic archipelago. This multi-year activity is being done in distinct units. Currently she is working on the Saxifragaceae, Salicaceae and the Fabacaceae, which follows from her significant efforts to produce a CD-ROM on the Fescue Grasses of North America. Fescue grasses are of huge importance in North America, both environmentally and economically.

Dr. Gillespie is involved in the Arctic flora activity, but also uses DNA analysis to probe the phylogeny of Arctic flora. She is also pursuing a long-held interest in the systematics of the Euphorbiaceae, the fifth largest flowering plant group, which includes some well known members such as the Brazilian rubber tree and the poinsettia. The Spurge family of plants (part of the larger group Euphorbiaceae) is economically important for such products as rubber, castor oil, and cassava.

LICHENS Some of the best bio-indicators are the ones that do not move about once established. Lichens are long-lived plants that have been used as environmental indicators, and for other purposes such as medicinal remedies. Dr. Irwin Brodo has researched lichens from all

over the world, and is currently working on a joint venture with Yale University Press and Steve and Sylvia Scharnoff to produce *The Lichens of North America*. He continues to publish articles on the lichens of the Queen Charlotte Islands, and is leader in two activities, "The Rare Lichens of Canada" and the "The Rare Lichens of Ontario."

BEETLES A once prominent scientist and philosopher, Dr. J.B.S. Haldane, once commented on God's preferences by saying there seemed to be "an inordinate fondness for beetles." Dr. Robert Anderson tries to make sense of the taxonomic challenges of such a diverse group of animals. Dr. Anderson has a number of activities based in Costa Rica, Mexico, and Central America. His primary focus is on weevils, a largely herbivorous group of beetles. He is especially interested in those that provide the service of turning leaf litter on the forest floor back into dirt. Dr. Anderson recently completed two chapters in the book entitled *Insects of the Yukon* produced by the Biological Survey of Canada.

MINNOWS AND LAMPREYS Fish are important worldwide as food (for humans and other predators), as invasive species, and as part of recreational activities. Drs. Brian Coad and Claude Renaud are ichthyologists who are taking part in the Rideau River activity. Dr. Coad is a specialist on minnows (especially those of Eurasia), the most abundant family of fishes in the world. He and his co-workers are investigating the status of several species that are a conservation concern, both abroad and here in Canada.

Dr. Renaud has also demonstrated how historic collections of lampreys can be compared against contemporary collections to investigate the rate of contamination by certain pesticides, such as DDT. His expertise on gadids qualified him to review a recent status report on the Atlantic cod, submitted to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Many such reports on the status of Canadian flora and fauna are reviewed by CMN researchers each year.

OCEAN BIVALVES AND ZEBRA MUSSELS Molluscs are a huge

The Fescue Grasses of North America CD-ROM is available from the CMN for the cost of shipping and handling

and diverse phylum of animals. Dr. André Martel is an aquatic invertebrate expert, with a particular interest in bivalve molluscs. His work has seen him dive (literally) into waters on all three of Canada's coasts, and into many of the freshwaters in central and eastern Ontario. His marine work, using larval forms of mussels, will provide a method of identifying species reproducing and settling in a given area. The ability to identify juvenile mussels could be of tremendous importance to the mariculture industry, where closely related species—bringing quite different prices at market—often live in the same area and look quite similar as adults. His work in Ontario has been to monitor the progressive invasion of the zebra mussel, and its significant harmful effect upon native clam populations.

His newest, most challenging assignment begins later this year, when he goes to Vancouver Island to continue his marine research and also act as the Assistant Director of the Bamfield Marine Station. This is a joint position between the CMN and the Station.

RESEARCH-RELATED ACTIVITIES The CMN has at least three support functions that are directly related to biodiversity research.

BIOLOGICAL SURVEY OF CANADA Since 1980 the CMN has supported and participated in the Biological Survey of Canada. Currently there is a well-established terrestrial arthropod module, which is acting as a precursor to a module in parasitology. The role of the Survey is to catalyze and coordinate research activities on specific groups of species. It does this largely through enhancing effective communication among large groups of researchers. The Biological Survey is headed by Dr. Hugh Danks, a CMN entomologist, and President of the Entomological Society of Canada.

COLLECTIONS MANAGEMENT AND CONSERVATION RESEARCH CENTRE In order to have natural history collections that are valuable to research over a long period of time, it is important to understand how best to store them. Rob

Waller is the Chief of the Collections Management and Conservation Research Centre at the CMN. Mr. Waller is currently investigating the most effective storage chemicals for wet collections, and the ideal humidities for storing some dry collections. His team of workers has an extensive knowledge of collection conservation and provides the most up-to-date information to the collections staff of the CMN and (in workshop format) to other museums.

CANADIAN CENTRE FOR BIODIVERSITY The CCB is lead by Anne Breau and is an effective link between the Museum and other agencies with similar interests. For example, the CCB is the chief liason between the Museum and the Committee on the Status of Endangered Wildlife in Canada, and the Biodiversity Convention Office. The CCB is also home to the Secretariat for the Canadian Committee for IUCN—The World Conservation Union. There are countless other occasions where research knowledge from the CMN informs decision makers, and the CCB plays a key role in delivering that knowledge to those who need it. The CCB also has the ability to assist with Country Studies, advising decision makers and researchers who wish to create an infrastructure to study their biodiversity. Jean Lauriault has been especially effective in this effort in several African countries.

The Museum's science expertise is also applied through its key role in the Federal Biosystematics Partnership. This group of federal departments and agencies



A diver records the movement of grounded ice at Sight Point, Resolute, NWT
Photo: K. Conlan

A grounded iceberg in
the Barrow Strait, NWT
Photo: K. Conlan



recognizes, summarizes and supports the activities of biosystematics experts. In addition to other activities that are product oriented, the partners play a national advocacy role, and are the sole focal point in Canada for biosystematics. The partners are from Agriculture and Agri-Foods Canada, Environment Canada, the Department of Fisheries and Oceans, the Forest Service of Natural Resources Canada, and the Museum of Nature. Museum researchers also have a national impact through their participation on the Scientific Advisory Committee and the sampling protocol working groups of the Ecological Monitoring and Assessment Network.

CONCLUSION For the last two years, the CMN put itself under the microscope during a massive consolidation effort, which resulted in the entire collection and most of the staff moving into one enormous, new building located in Aylmer, Quebec. The Castle, continues its 85-year-old tradition of being the Museum's permanent educational display site. Through the expertise of our research, collection and public programming staff at these two sites, the Canadian Museum of Nature continues on its path of renewal and revitalization—an important part of Canada's scientific integrity and natural heritage.

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FORUM

Wake up, conservation biologists!

From Minna J. Hsu and Govindasamy Agoramoorthy,
National Sun Yat-sen University, Taiwan

Conservation biologists have known for a long time that the world's ecosystems and species were in trouble. Fifty years ago the World Conservation Union (IUCN) was established with the aim of conserving biological resources. However, it wasn't until the 1970s—when the United Nations organized a series of conferences on population, food, the role and status of women, human settlement, water, desertification, primary health care, world development, and the law of the sea—that conservation awareness began to spread. This burgeoning awareness led to the 1992 Rio Summit, which built a foundation for an international environmental law that could stand for generations. Since then Parties to the Convention on Biological Diversity have been grappling with the very difficult and complex task of conserving biodiversity around the world. Scientists have been progressing with the monumental task of compiling inventories of fauna and flora and preparing plans for the management of global biodiversity.

The task is daunting. Despite decades of effort by biologists to conserve natural resources, the rate of forest loss, for example, has accelerated dramatically in recent years. Tropical forests continue to be destroyed at a rate of 17 million hectares per year and there are similar losses across the temperate and northern forests of Canada, Europe, Russia, and the United States. Furthermore, many countries in southeast Asia and South America, whose ecosystems have remained relatively undisturbed until recently, began to undergo rapid change in the 1980s, losing 10-30% of their forests in a single decade. As a result, the list of endangered species in the IUCN's Red Book is lengthening annually.

The good news is that the time for conservation biologists to secure funding for their crucial work has never been better. If you turn on a television or glance through a newspaper, topics such as climate change, the greenhouse effect, and natural resources conservation dominate the headlines. From Indonesia to the United States, presidents are talking about ways to reduce pollution levels and to avoid environmental catastrophe. It appears that political elites and the ordinary public around the world are finally getting the message that conservation biologists have been writing for the past decades.

When the renowned chimpanzee researcher Jane Goodall visited Taiwan in September 1997, President Lee Teng-hui personally accompanied her to Kenting National Park to witness the re-introduction project of sika deer that has been ongoing for over a decade. The elegant sika deer became extinct in the wild during the 1960s as a result of unscrupulous hunting and habitat destruction begun during the Dutch occupation and continued through the Japanese occupation. Fortunately, a captive propagation project had kept several of the deer alive and led to the re-introduction of a group into the wild. On this visit—his first to the project—President Lee donated one million Taiwanese dollars (US \$35,000) to Jane Goodall. This is the first time a President or a senior politician in Taiwan has donated his own funds for wildlife conservation.



Send us your views

The Canadian Museum of Nature is pleased to provide an open forum for diverse viewpoints even though they may not represent the views of the Museum itself. Comments on articles in *Global biodiversity* and any biodiversity issues are welcomed.

Anonymous contributions will not be published. Please note: by sending in your views, you give the Canadian Museum of Nature permission to publish your views on our web site <<http://www.nature.ca/english/gbfor.htm>> and/or in *Global biodiversity* magazine. We reserve the right to edit or condense comments as required. E-mail: <dcameron@mus-nature.ca>

Fax: 613-566-4763. Mail: *Global biodiversity* Forum, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario Canada K1P 6P4.

Sika deer

Illus.: Roelof Idema

While his donation certainly cannot match those made recently by Ted Turner to the United Nations or by George Soros to Russia for improving the human social welfare programs, President Lee's donation for wildlife conservation in Taiwan generated news coverage that spread like wildfire to millions of people.

The time is ripe for conservation biologists who must develop immediate strategies for conserving rapidly declining populations of wild flora and fauna and their habitats. Funding is the bottom line—without it, theoretical policies are difficult to convert into more practical management strategies to conserve global biological resources. Biologists throughout the world must secure long-term funding from their respective governments—not only to protect natural resources, but also to improve social conditions for the people who live around threatened areas. Conservation and wise use of natural resources in tropical countries can be achieved only by informed and educated people who have a healthy social and economic status in their society. In order to safeguard global biological resources and to balance human needs in the ever-changing environment, it is up to the salesmanship of the conservation biologists to secure enough public and private funds from the now receptive politicians and people.

Cracks are showing in the MAI structure

Judyth Mermelstein

The key concept to grasp about the MAI is that it was written specifically to limit the powers of governments and to free investment from government interference on behalf of local economies or human rights. That is why for two years promoters of the MAI insisted that any terms that do not ensure the rapid flow of capital from country to country be considered as either a country-specific reservation or a non-binding "side deal" (For example, calling on investors to voluntarily police themselves on things like child labour and pollution.).

Now, it is true that we "MAI-nots" tend to be looking for worst-case scenarios under the pre-February draft. From the modified positions of various governments (including France and Canada) following the February negotiating sessions, it's really anyone's guess what will be contained in the final draft of the MAI. Policy differences between

and within nations were certainly papered over by keeping the MAI process away from scrutiny by those in government who care about anything but the bottom-line.

What we have done is tear the paper off and let everybody look at the gaps. Nobody with half a brain would object to negotiations that attempt to develop a fair set of rules for international trade and economic co-operation. But it doesn't take a law degree or a radical perspective to realize that this MAI has been written to be totally one-sided, with the role of governments clearly of less importance than the rate of return on investment.

Even people who believe firmly in free trade and traditional individualistic capitalism do not necessarily want to lose their domestic constitutional rights or their power to influence their own governments. Some of these people, whom we might be tempted to lump into the "neo-liberal, neo-conservative" category, are decent human beings who do not want their investments used to despoil the planet and exploit other people. They even seek out ways of investing in "Green Funds" because they care as much about the lives of their children and grandchildren as they do about their own prosperity.

Much as I hate to acknowledge this, it matters a lot more that we make these people aware of the flaws in the concept of a "single global economy that has nothing to do with sovereignty, the environment, or human rights," as advocated by Jean Chretien and Sergio Marchi. We, the politically aware on the economic margins, are far less persuasive in political circles than the people who have dollars to invest and who would choose to boycott institutions that have been proven irresponsible and exploitative.

It is assumed in high places that our voices can be discounted as those of the "lunatic fringe," but no politician dares ignore the outrage expressed when somebody tries to infringe on the rights of the vocal middle-class taxpayer. If we can make it clear to these people that they are the ones who will be paying for the privilege of breathable air and drinkable water, losing their homes and retirement funds if a family-member gets sick; seeing their children unable to find meaningful work or support families of their own; then there is real hope that the situation can be turned around and a set of international rules negotiated which will benefit all rather than a select few.

CYBERDIVERSITY

Global biodiversity is pleased to provide Internet links relevant to biodiversity within the Canadian Museum of Nature web site. This season the following sites have been posted. If you know of a great site, let us know. The URL is <<http://www.nature.ca/english/gbcyber.htm>>.

CGIAR DEVELOPS AN INTERNET DATABASE FOR GENETIC RESOURCES

The UN Consultative Group on International Agricultural Research has produced a database of over 600,000 samples of crop forage and tree germoplasm called the System-wide Information Network for Genetic Resources (SINGER). The URL is <<http://www.cgiar.org/Singer>>. [Intellectual Property and Biodiversity News, 6(20), 1997]

THE JOURNAL OF INTERNATIONAL WILDLIFE LAW AND POLICY SEEKS INFORMATION AND MATERIALS FOR ITS WEB SITE

Including the following:

- Information about NGOs that focus on wildlife issues (international and national). Send the address, URL, phone number, etc. Copies of national legislation implementing international wildlife treaty regimes.
- Wildlife bibliographies, or the URL of bibliographies on the web.

Contact: Wil Burns, Managing Editor, Journal of International Wildlife Law & Policy, 1563 Solano Ave., Berkeley, CA, U.S., 94707; phone: (510) 658-5946; e-mail: <JIWLP@earthling.net> [<greenlifesociety@email.msn.com>]

"WORLD OF TREES" EDUCATIONAL WEBSITE

This site was introduced in 1996 with financial backing from Domtar and the Ministre de l'Éducation du Québec and the collaboration of the Commission scolaire des Patriotes and Sylvico Inc. Special attention is given to the effects of the ice storm in the east and the subsequent impact on the trees. "World of Trees" website: <www.domtar.com/tree> [French: <www.domtar.com/arbre>] [Marlène Gauthier, Sylvico inc., e-mail: <mg@pagebleu.com>]

"FAX THE FEDS" WEBSITE ALLOWS FOR GREATER PUBLIC INPUT

This site allows you to send federal politicians a message via e-mail. This free service provides access to Ministers (alphabetized by ministry) and Members of Parliament (alphabetized by member). You can also link or send messages to international diplomatic missions based in Ottawa (alphabetized by country). When sending your message, you should:

- Include your postal address in order to receive a reply
- E-mail a copy of your message to yourself for future reference
- Receive confirmation messages by e-mail that your fax was transmitted.

The site's URL is <<http://www.net-efx.com/faxfeds/>>. [Kathleen Hamilton, E-mail: <knhamilton@coastnet.com>]

THE GLOBAL PLANT CHECKLIST

The International Organization for Plant Information is making a comprehensive global plant checklist available on the web. Presently, the list includes over 300,000 vascular plant species and over 1,000,000

names from North America, Australia and Europe. The data is based on lists assembled by Flora Europaea, ITIS, and the Australian Census of Vascular plants. Non vascular plants (mosses, lichens, algae, and liverworts) will be added in the future. The site's URL is <<http://iopi.csu.edu.au/iopi>> [Karen L. Wilson <karen_wilson@RBGSYD.GOV.AU>]

NEW SET OF ABSTRACTS ON INSTITUTE OF MARINE BIOLOGY WEB SITE

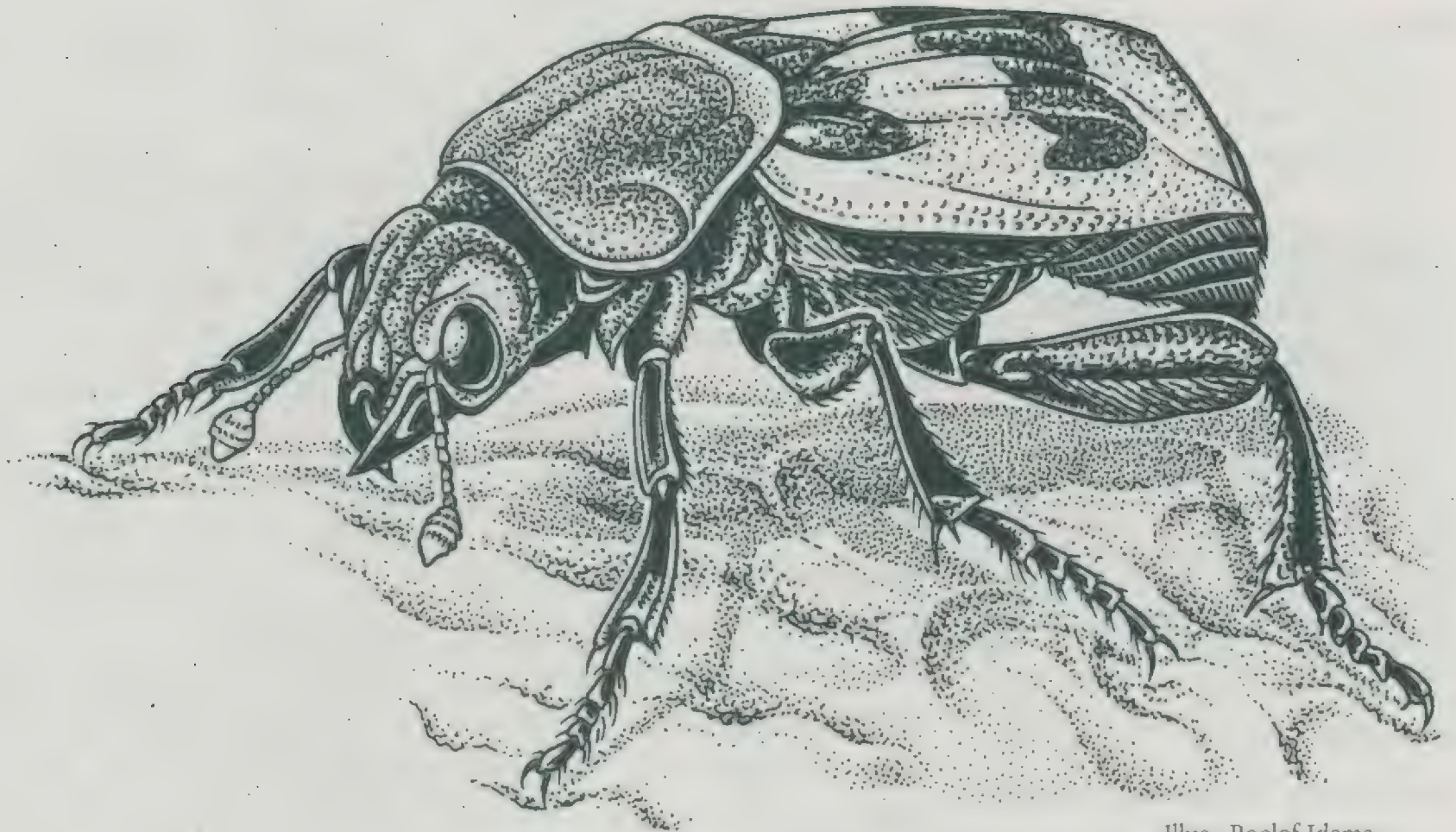
All abstracts from the workshop "New Directions in Systematics" 1997, organized by the European Science Foundation Network in Systematic Biology, can now be accessed on the IMBC Web site. The abstracts are divided into four sections:

- Personal Perspectives
- Taxonomic Challenges of Species-rich Groups
- Links Between Developmental Biology and Systematics
- Bioinformatics: Using and Communicating Taxonomic Knowledge.

The abstracts can be accessed through the IMBC's Bibliographical Services Page, URL: <http://www.imbc.gr/biblio_serv/index.html>. Also available is an outline of the objectives of the workshop (see URL: <http://www.imbc.gr/whats_new/news/workshop.html>) and a link to the workshop program (see URL: <http://www.imbc.gr/whats_new/news/programme.html>). [IMBC, Greece; E-mail: <idd@imbc.gr>]

Beetles

Nicrophorus sayi



Illus.: Roelof Idema

Beetles of the genus *Nicrophorus* are most commonly found at vertebrate carcasses. These large black and orange beetles have the common name of carrion beetles or burying beetles. The latter name comes from their habit of first finding and then burying the carcass of a small vertebrate such as a mouse, vole, frog or snake.

Working together in an underground chamber, a male and a female beetle prepare the carcass by stripping it of its fur (if it has any), forming it into a round ball, and then coating it with secretions that appear to prevent or at least slow decay. The pair mate, and the female beetle then lays eggs in the nearby soil. When the eggs hatch, the small beetle larvae move into a hole in the carcass that their mother has made. The larvae eat liquid regurgitated to them by their mother until they are able to feed on the carcass on their own.

When they have finished feeding (usually after about 7-10 days), the larvae move into the nearby soil and pupate, emerging as adults in about two weeks. During their growth they are guarded by the mother beetle, who remains in the

chamber until they pupate. *Nicrophorus* beetles are particularly interesting in that they are one of a very few groups of beetles that has achieved some level of sociality, which includes the protection, rearing and progressive feeding of their young.

The species illustrated here is *Nicrophorus sayi* LaPorte from eastern North America. One of 15 species of *Nicrophorus* that occur in Canada and the U.S.A., adults of *N. sayi* are active early in the spring, searching for carcasses often while there is still snow on the ground. The U.S. Fish and Wildlife Service federally lists one species, *Nicrophorus americanus* Olivier, as an endangered species.

Dr. Robert Anderson, Research Scientist, Entomology, Canadian Museum of Nature.

SUCCESSSES & INITIATIVES

INSTITUTE OF BIODIVERSITY AND ENVIRONMENTAL CONSERVATION (IBEC)

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If the Institute of Biodiversity and Environmental Conservation (IBEC) were an organism, I would give it its own family, along with genus and species. IBEC is a new, aggressive and innovative body that was established at the Universiti Malaysia Sarawak to carry out research activities in Borneo in 1994. Its aim is "to scientifically understand the ecological principles and benefits that biodiversity holds for humanity and to promote the wise management and use of the nation's biotic wealth through ways that do not adversely effect our environment." Now into its fourth year, IBEC has proven that a multifaceted approach to biodiversity conservation—spanning marine and terrestrial ecosystems—provides a comprehensive backdrop against which modern management policies and decisions can be made.

Under its charter, IBEC promotes research programs and the acquisition and dissemination of knowledge in priority areas of environmental science and technology. In



Photo: N. Pilcher

particular, emphasis is placed on processes and technology applicable and relevant to tropical environments. As such, the Institute has comprehensive and fully active research, monitoring, and conservation programs operating in northern Borneo and its surrounding waters. IBEC is supporting research *programs* in preference to research *projects*, in the firm belief that cooperative work towards a single objective yields the most beneficial results for the nation.

IBEC is eager to forge collaborative links with other academic and research institutions, nationally and internationally, to exchange information and ideas. By promoting collaborative research and creating dynamic environments for research and education, the Institute hopes to combine scientific knowledge from around the globe with traditional management practices to preserve the distinctive Bornean natural heritage.

Funding of IBEC's research activities comes from a variety of sources, with the Malaysian government being the prime supporter. To encourage a diverse research team, IBEC welcomes Research Fellows to carry out their research in Borneo. Scientists interested in working on particular aspects of biology, ecology, and conservation invariably become aware of the Institute through colleagues and submit research and funding proposals that are reviewed by the Director. The number of Research Fellows now stands at nine, along with four permanent staff members. Research Fellows are encouraged to provide funding for their projects through outside agencies, although seed money is often available to permanent staff members for major projects. At present over 50% of the Institute's research budget is provided through funding agencies, charitable organizations and foundations, and intergovernmental agreements.



Educational opportunities complement IBEC research programs. The Institute supports post-graduate students at the Masters and Doctoral levels with research-oriented programs supervised by the Institute's in-house Researchers, University Faculty staff, and outside specialists. Post-graduate students have the opportunity to become Research Fellows at the completion of their study program should they be able to secure funding for continued research. By creating positions for local post-graduate students, IBEC contributes to the development of a backbone of local expertise. It is hoped that these local experts, acting as dedicated resource managers, conservationists, and scientists, will contribute to the future sustainable development of the nations' biotic wealth. Thus, IBEC meets one of its goals: the expansion of Malaysia's scientific capability toward biodiversity conservation.

With its multifaceted approach to biodiversity conservation, the Institute's research activities are broad-based, ranging from marine to

terrestrial ecosystems, across the divisions of Sarawak and Sabah. Additionally, IBEC's activities are now spreading into Indonesian Borneo, with the establishment of a marine turtle research and conservation program initiated in Derawan, East Kalimantan.

The Institute has recently seen a rise in activity in the field of marine sciences. One marine program focuses on coral reefs. In 1996 on Layang-Layang atoll, 300 kilometres north of Kota Kinabalu and among the Spratley Islands, IBEC staff successfully documented the marine flora and fauna of the reefs. The team also carried out investigations into the ecological processes that enable the reef to act as a primary producer for the South China Sea fisheries. The project was carried out with the assistance of graduates from the University of Aberdeen in Scotland, the Malaysian Navy, and many other sponsors. In 1997, this program was expanded to cover 55 sites spanning the entire coastline of Sabah, contributing to the 1997 International Year of the Reef data

collection program, ReefCheck.

A long-term coral reef monitoring program was also established in which permanent quadrats (squares) were marked and photographed to enable studies on coral health and growth rates. These plots have been established in line with the Institute's commitment to environmental monitoring for conservation purposes, and will become more extensive as time and research allows. To date, two years of information are providing an insight to coral reef dynamics and development.

Another marine research program focuses on sea turtles. By collaborating with rangers from the Sabah Turtle Islands Park, IBEC has established programs for monitoring egg development and hatchling survival on these crucial islands. This research is currently guiding the management efforts of the Park staff for hatchling dispersion patterns and adult nesting based on sound scientific principles. Research is currently focusing on temperature and sex ratios in developing nests, and on hatchling swimming rates and energy utilization.

Preliminary surveys of marine biodiversity have also been carried out along most of the Sarawak coastline as part of IBEC's comprehensive Coastal Zone Management efforts. The Institute has recruited four post-graduate students to work on this project, covering crustaceans, molluscs, fishes, and mangroves.

Terrestrially, IBEC continues to build upon its work in the early years, with the main research centred around Mount Kinabalu and its surrounding regions, Lambir Hills,

and more recently, southern and central Sarawak. In the field of botany, Research Fellows are studying succession in secondary forests, and are in the process of completing a database on Sarawak orchids. This invaluable work will enable botanists from around the world to access updated information on native orchid distribution and collections.

After two years of extensive surveys, a database of the birds of Sarawak has been compiled, and two checklists have been published for Sarawak's avifauna.

IBEC has also initiated research into the ecology of fig wasps in the National Parks of Sarawak, and now intends to develop a broader coverage of entomological research throughout the state. The collections of ethnobotanical specimens continue at Mount Kinabalu, along with social studies at villages surrounding the Park.

IBEC, in conjunction with the Institute of Software Development, has now completed the installation of its GIS facilities, which are available to all UNIMAS-based researchers. An IBEC Research Fellow currently teaches GIS courses at the undergraduate level for other university faculties. GIS now plays a major role in many of the Institute's research programs, and databases containing records of the State's biodiversity grow with each field trip undertaken by the Institute's staff.

IBEC is flourishing. It is now solidifying its national standing as a leading agency responsible for the conservation of Bornean flora and fauna, and is being recognised, both

nationally and abroad, as a leader in its chosen fields of study. At the same time, the Institute also wants to meet the challenge of the developing multimedia era. With an expected increase in Research Fellows, collaborative programs, and outside funding, the Institute aims to make much of its work available on the Internet and so stride forth to meet the new millennium.

[Submitted by Nicolas Pilcher, a Research Fellow at IBEC under the Shell Chair. His main research topics are marine turtles and coastal zone management and GIS, with which he has been involved both in Malaysia and in Saudi Arabia for the past ten years.]

CANADIAN INSTITUTE FOR BUSINESS AND THE ENVIRONMENT

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The Canadian Institute for Business and the Environment (CIBE) is a Canadian policy institute that was established in 1996. It examines the economic, business, and the job-creation impacts of environmental protection, pollution prevention, and efforts to reduce global warming gases, both in Canada and internationally. The Institute provides program and policy analysis in support of the environment industry, and specifically targets senior corporate and government officials working in environmental issues in Canada, the U.S., and Europe. Its biweekly newsletter, The Gallon Environment Letter, follows and reports on trends in the environmental business world. The letter is now sent to

3,200 decision-makers, including people at OECD, NATO, the United Nations, the World Bank, and the NAFTA Environment Commission. An associated service is the monthly publication of a "Green Jobs" newsletter.

The CIBE also provides research and critical paths for the implementation of sustainable-development projects by preparing a number of reports and submissions. So far, it has prepared six reports:

1. Report Card on Canada for Rio+5: Is it Meeting its Commitments, November 1996
2. Analysis of Five Canadian Environmental Cost Studies, March 1997
3. Annotated Literature Survey of Environmental Economics Publications, August 1997
4. Voluntary Environmental Measures: The Canadian Experience, August 1997
5. Impacts on Environment: Harmonization in Canada, October 1997
6. An Alternative Approach to the 1997 Federal Budget, October 1997

In addition to disseminating information, the Institute works with government and industry on analyzing and developing programs for voluntary environmental measures and economic instruments. For example, the Institute has been involved in expert and stakeholder sessions including:

- Industry Canada and Finance Canada ministries' sustainable development plan analysis;
- Fiscal Incentives and Disincentives for the federal Ministry of Finance



and Economics;

- National Pollutant Release Inventory (NPRI) Stakeholders Consultations;
- Experts Analysis of ARET Voluntary Environmental Measure; and
- House of Commons Committee testimony on Environmental Harmonization.

There are great opportunities to strengthen Canada's economy through the export of environmental goods and services. By providing Canadian environmental goods and services to emerging industrialized countries, CIBE supports the growth and development of the environment industry sector. The Institute has already worked with partners to complete several international market intelligence and development programs.

[Submitted by Gary Gallon, President of CIBE]

DARING TO BE DIFFERENT: THE MONTREAL BIODOME

Opened June 19, 1992, the Montreal Biodome, through its unique presentation of ecosystems, began a real museological revolution. In its first six months, it welcomed more

than one million visitors, resulting in a feverish level of museological activity. Awareness and public education are at the heart of the Biodome's objectives. We have given ourselves the mission of educating future generations on the protection, management and conservation of the natural heritage.

Bio, life; *domus*, house. House of life. The Biodome is the home of plants and animals housed in representative ecosystems. This environment museum is not a zoo, not a botanical garden, and not an aquarium. Its living collections develop together in an environment imitating as faithfully as possible the characteristics of their natural habitat: soil, water, light, temperature, humidity, and landscape. The rich living collections of the Biodome share the qualities of the western world's four vast natural habitats: the tropical forest, the Laurentian forest, the marine waters of the St. Lawrence and the polar realm.

The Biodome's animals belong to six important families: invertebrates, fish, amphibians, reptiles, birds, and mammals. A recent inventory revealed that the Biodome owns

7196 animals belonging to 214 species. Of these, the following are threatened: the golden lion marmoset (*Leontopithecus rosalia*), Goeldi's marmoset (*Callimico goeldii*), the blue macaw (*Anodorhynchus hyacinthinus*), the yacare caiman (*Caiman sclerops yacare*), the striped bass (*Morone saxatilis*) and the Atlantic sturgeon (*Acipenser oxyrinchus*).

Through our research and conservation programs, we try to breed these threatened species and we also intend, in cooperation with the concerned agencies, to reintroduce them in their natural habitats. In the case of many living organisms, the Biodome is a true gene pool. For example, the Biodome's tropical forest habitat—representing one of the richest habitats in the world—hosts 266 species belonging to 73 families. This extraordinary biodiversity allows us to undertake, in ideal conditions, a number of research and conservation projects.

The Montreal Biodome is a unique destination, as much at the museological level as at the local, national and international level. It owes its strength to the mandate that it gave itself and that it intends to continue serving: to offer everybody an unforgettable rendezvous with the living planet.

[Submitted by Michel Delorme, Scientific advisor, Montreal Biodome]

BIODIVERSITY MEETINGS

26-30 JULY 1998

The Second International Congress on the Biology of Fishes, to be held at Towson University of Maryland, Baltimore, U.S.

Contact: Don Mackinlay, Dept. Fisheries and Oceans, 555 West Hastings St., Vancouver BC, Canada, V6B 5G3; Tel: (603) 666-3520; E-mail: <mackinlayd@dfo-mpo.gc.ca>; or Dr. Jay A Nelson, Dept. of Biological Sciences, Towson University, Towson, Md., U.S., 21252; E-mail: <jnelson@towson.edu>, Web site: <http://www.towson.edu/~nelson/>

2-6 AUGUST 1998

Ecological Exchanges between Major Ecosystems, to be held in Baltimore, Maryland, U.S.

Contact: Fred Wagner, ESA Program Chair, Ecology Center, Utah State University, Logan, Utah, 84322-5205, U.S.; Tel: (801) 797-2555; E-mail: <fwagner@cc.usu.edu>

6-9 SEPTEMBER 1998

Environmental Responsibility in World Trade-an International Conference, to be held in London, UK.

Contact: International Seminars. The British Council, 1 Beaumont Place, Oxford, U.K., OX1 2PJ; Tel: 44-1865-316636; Web site: <http://www.britcoun.org/seminars/enviresp>

8-10 SEPTEMBER 1998

Coastal Environment 98, to be held in Cancun, Mexico.

Contact: Liz Kerr, WIT; Tel: 44-1-703-293223; E-mail: <liz@wessex.as.uk>

14-18 SEPTEMBER 1998

Fifth International Botanic Gardens Conservation Congress, to be held at Kirstenbosch, Cape Town, South Africa.

Contact: Prof. Brian J. Huntley, National Botanical Institute, Private Bag X7, Claremont 7735, South Africa; Tel: 27-21-762-1166; E-mail: <bgtci98@nbict.nbi.ac.za>

21-25 SEPTEMBER 1998

XV Eucarpia General Congress "Genetics and Breeding for Crop Quality and Resistance", to be held in Viterbo, Italy.

Contact: Dr. Mario A. Pagnotta, XV Eucarpia Congress, University of Tuscia, Via S.C. de Lellis, 01100, Viterbo, Italy; E-mail: <eucarpia@unitus.it>; Web site: <http://www.unitus.it/confsem/eucarpia/eu.html>

5-7 OCTOBER 1998

Fifth International Conference on Remote Sensing for Marine and Coastal Environments, to be held in San Diego, CA, U.S.

Contact: Nancy Wallman, ERLM, Box 134001, Ann Arbor, MI, U.S., 48113-4001; Tel: (313) 994-1200, ext. 3234; E-mail: <wallman@erim.org>



Illus.: Roelof Idema

10 OCTOBER 1998

1998 Natural Areas Conference, "Planning for the Seventh Generation", to be held on Mackinac Island, Michigan, U.S.

Contact: *Great Lakes Natural Areas Conference, PO Box 30180, Lansing, MI, U.S. 48909-7680, Web site: <http://wildlife.dnr.state.mi.us/HomePages/Meetings/Natural_Areas_1998>*

13 OCTOBER 1998

NGO Consultation Prior to GEF Council Meeting, to be held in Washington, D.C., U.S.

Contact: *GEF Secretariat, 1818 H. Street, NW, Washington, DC, U.S., 20433; Tel: (202) 473-3202*

19-22 OCTOBER 1998

International Conference on Tropical Forests and Climate Change: Status, Issues and Challenges, to be held in Manila, Philippines.

Contact: *The Secretariat, International Conference on Tropical Forests and Climate Change, Environmental Forestry Program, UPLB College of Forestry, 4301 College, Laguna, Philippines; E-mail: <enfor@laguna.net>*

9-11 NOVEMBER 1998

Assessing the Ecological Integrity of Running Waters International Conference, to be held in Vienna, Austria.

Contact: *Michael Kaufmann, Dept. of Hydrobiology, Fisheries and Aquaculture, University of Agricultural Sciences, Max Emanuel-Strasse 17, A-1180 Vienna, Austria; Tel: 43(1) 47654-5226; E-mail: <confer@mail.boku.ac.at>, Web site: <<http://iwgf-sig.boku.ac.at/fish/hfahome.htm>>*

23-27 NOVEMBER 1998

Biodiversity, Biotechnology and Biobusiness: Second Asia-Pacific Conference on Biotechnology, to be held in Perth, Australia.

Contact: *Michael Borowitzca, Murdoch University, Biodiversity, Biotechnology and Biobusiness, Congress Werst Pty Ltd, PO Box 1248, West Perth, Australia, WA 6872; Fax: 61-8-9322-1734; E-mail: <biodiversity@science.murdoch.edu.au>*

FEBRUARY/MARCH 1999

Third Session of The Intergovernmental Forum on Forests, to be held in Geneva, Switzerland.

Contact: *IFF Secretariat, Two UN Plaza, 12th Floor, New York, NY, U.S., 10017; Tel: (212) 963-6208; Web site: <<http://www.un.org/dpscd/dsd/iff.htm>>*

BIODIVERSITY NEWS

OIL EXPLORATION THREATENS PAKISTAN'S LARGEST NATIONAL PARK

Oil exploration may take place within Kirthar National Park in Pakistan. Although Premier Oil was denied access by the Sindh Wildlife Department, a concession was sold by Pakistan's director general for petroleum concessions. The environmental impact assessment being coordinated by the Hegler and Bailey consultant team was contracted by Premier Oil. For more information contact Ayaz Latif Palijo, Chairperson, Sindh Research Council, Tel.: 92-221-651947, 651725; or E-mail: <ayazl@paknet3.ptc.pk>. [*The Gallon Environment Letter*, 2(1), 1998]

BIOPIRACY IN INDIA

The People's Commission on Biodiversity, Indigenous Knowledge, and People's Rights was established in March 1997 to investigate blatant biopiracy in India by multinational companies. In order to understand how biopiracy impacts the community and nation, hearings were conducted in Delhi by the Commission to foster interaction and encourage feedback from farmers, representatives of the seed industry and tribal groups, as well as scientists. The Commission is a fully independent body that will release its findings to the government and provide guidance in the process of changing the current patent laws in India. [*The Ecologist*, 26(6), Nov/Dec 1997].

WELCOMING THE WASWANAPI CREE MODEL FOREST

The Canadian Minister of Natural Resources, Ralph E. Goodale, has announced the unveiling of a new Model Forest in Québec. The Waswanipi Cree Model Forest was officially acknowledged at a signing ceremony in Waswanipi on 17 September 1997. The new Model Forest is located more than 600 km northwest of Quebec City and will encompass 209,600 ha. The management of the Waswanipi Cree Model Forest will include individuals and organizations with different areas of expertise, such as the National Aboriginal Forestry Association, the Quebec Ministry of Natural Resources, Laval University, Nabakatuk Co. and the Waswanipi Mishtuk Corporation. [*Down To Earth*, 4 December 1997].

MONITORING INDUSTRIAL WASTE IN TROUT

Bioassays are the conventional method of testing trout for waste toxicity. Each test uses up to 60 litres of industrial waste, killing more than 100 trout each time. A new procedure that could reduce or perhaps replace the trout bioassay, is being developed by François Gagné and Christian Blaise of the St. Lawrence Centre. The new approach uses a primary trout hepatocyte (liver cell) culture to measure waste toxicity.

The benefits associated with the new technique are:

- the number of fish required for proper testing is significantly less
- decrease in costs (\$75 compared to \$400)
- allows for more detailed research on sublethal effects of pollutants (e.g., DNA damage)

A process of validation work is being conducted for the new method, indicating that a toxic effect within the hepatocytes registers a trout mortality effect in 95% of the samples. This validates the hepatocyte primary culture method as a complement to the bioassay. For more information, contact the St. Lawrence Centre by phoning (514) 283-7000. [*Let's Talk Green*, 7(5), 1997]

CHICKPEAS AND BIOPIRACY

The Australian seed industry wants to monopolize two varieties of Asian chickpeas by applying for plant breeder's rights. Farhad Mazhar of the Bangladeshi organization UBINIG and the South Asian Network of Food, Ecology, and Culture expresses his outrage: "It's blatant biopiracy. Australia is privatizing seeds that belong to our farmers, and they plan to sell them back to us with their own self-authorized plant monopoly." [Rafi press release, 6 January, 1998; for more information see the press release at: <<http://www.rafi.ca/pr/release09.html>>]

*Special thanks to
Michael Giddy of
Carleton University for
compiling this section.*

Update: Two Australian crop development agencies, which applied for patents on two varieties of chickpeas taken from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), were forced to drop their bids. The agencies signed an agreement with ICRISAT, stipulating that they would not commercialize or license the varieties obtained for research purposes. The Rural Advancement Foundation International (RAFI) was responsible for bringing justice to the chickpea piracy case. [*Terraviva* (IPS), 27 January 1998; RAFI press release, 1 February, 1998 <<http://www.rafi.ca/>>]



Soybean
(*Glycine max* L.)
Illus.: Roelof Idema

US OPPOSES EU'S PLANS TO LABEL GENETICALLY MODIFIED GRAINS

The United States Secretary of Agriculture Dan Glickman argues that the process of labelling genetically modified organisms (GMO) would impede the sale of any fungible commodity like corn or soybeans. However, some European countries that belong to the Working Group for Foods Produced Without Genetic Engineering (such as Austria) have established their own labelling system to identify food produced with GMO grain products. Members strive to keep their products GMO-free. The European Commission, with the help of the member countries in

the Working Group, is working towards the development of an EU-wide label by mid-summer 1998. [*Intellectual Property and Biodiversity News*, 6(20), 1997]

FOOD SAFETY GUIDELINES SCIENTIFICALLY BASED?

The US initiative to develop new produce safety guidelines is being questioned by a number of produce groups throughout North, Central, and South America. These groups argue that the Clinton administration's rush to develop guidelines will marginalize participation in the produce industry. Furthermore, they claim the hard-line stance on food safety is ill-conceived because of scientific uncertainty in microbiological food safety issues. The group contends there is little evidence that points towards the legitimacy of produce and food-borne illness. The produce groups say more research is needed in the area of microbiological food-borne illness before the proposed guidelines can be implemented. The guidelines will be constructed by the US Food and Drug Administration, along with several other federal agencies with the target release date of June 1998. [*Intellectual Property and Biodiversity News*, 6(20), 1997]

COURT RULES IN FAVOR OF ONTARIO CONSERVATION GROUPS OVER LOGGING PLANS ON CROWN LAND

An Ontario Divisional Court decision declared that the Ontario Ministry of Natural Resources (OMNR) violated the law in approving three of six large-scale logging plans in northern Ontario. This represents a significant victory for the conservation groups. In the past the OMNR failed to abide

by the legal framework guiding the development of logging plans on public land. The court has given the OMNR one year to restructure management plans and achieve compliance with the laws. [Great Lakes United <glu@igc.org>]

HARMONY FOUNDATION: TEACHING SUSTAINABLE PRACTICES

The Harmony Foundation is a non-profit organization that offers training in sustainable environmental practices. The tenth annual Summer Program of the Institute for Environmental Values Education begins in July 1998. The Institute invites community leaders, educators, youth or anyone interested from across Canada and the world. It is a residential training program aiming to provide useful skills and resources to participants in order to facilitate success with local projects and initiatives. For more information contact Harmony Foundation, 1183 Fort St., Victoria, BC, V8V 3L1; Tel.: (250) 380-3001; e-mail: <harmony@islandnet.com>; or visit the website: <<http://www.harmonyfdn.bc.ca/~harmony>>. [Erica Kjekstad]

"CITIZEN'S GUIDE TO POLLUTION PREVENTION" RELEASED

On 27 January 1998, The Canadian Institute for Environmental Law and Policy (CIELAP) released the "Citizen's Guide to Pollution Prevention," which provides a conceptual basis and methodology for pollution prevention. Several case studies cited in the publication provide sound examples of the numerous benefits of pollution prevention, such as reducing the amount of toxic chemicals released

into the environment, minimizing energy consumption, improving safety, and cutting costs. Anne Michell, Executive Director of CIELAP, states, "The Guide encourages individuals in their daily lives to be part of the solution, instead of being part of the problem." For more information contact Jan Rabantek, Project Officer, CIELAP; Tel.: (416) 923-3529; E-mail: <cielap@web.net>; Web site: <www.web.net/cielap>. [CIELAP <cielap@web.net>]

EIGHT YEAR BOYCOTT ON TWO MITSUBISHI SUBSIDIARIES ENDS

Both Mitsubishi Motor Sales of America and Mitsubishi Electric America have yielded to demands that more care must be taken with the environment, and so the Rainforest Action Network has called off all boycotts and protests against these two companies. Both companies have agreed to help in the preservation of rainforests and their native inhabitants by implementing the following measures:

- ending the use of old-growth forest products and phasing out the use of tree-based paper and packaging products by 2002.
- adopting alternative fibres, such as those created from agricultural waste products.
- creating a "forest community support program", to provide funding for the restoration and preservation of the remaining rain forests.
- supporting the people who inhabit the forests.
- establishing a joint system of "ecological accounting" to track improved environmental performance in manufacturing, distribution and

sales. The system will measure resource productivity, pollution, energy use, and environmental progress. [London Financial Times, 12 February 1998]

THE THAMMASAT RESOLUTION

A wide range of international representatives met from 1-6 December 1997 in order to address the problem of increasing privatization of biodiversity. This seminar, held in Bangkok, emphasized the need to exclude life forms from patent and other intellectual property rights (IPR) systems. The issues of biopiracy and the monopolization of biodiversity were also considered.

The main impetus for growing privatization is the Trade Related Intellectual Property Rights (TRIPS) agreement of the World Trade Organisation (WTO). This agreement requires developing countries to provide a form of IPR on plant varieties by the year 2000 in the form of either patents or by a *sui generis* rights system. The representatives feel that the *sui generis* option under the TRIPS agreement is an avenue to IPR and will lead to monopoly rights over plant varieties. An action plan resulted from the seminar to monitor the prescribed goals of the Thammasat Resolution. For more information contact Henk Hobbelink, Genetic Resources Action International by e-mailing <Henk.Hobbelink@igc.org>. [Henk Hobbelink]

BOOK REVIEWS

The Last Frontier Forests: Ecosystems and Economies on the Edge.

Dirk Bryant, Daniel Nielsen and Laura Tangle. 1997.
World Resources Institute, Forest Frontiers Initiative. Data
Collaborators: World Conservation Monitoring Centre and
The World Wildlife Fund

With the publication of *The Last Frontier Forests* by the World Resources Institute (WRI), understanding the status of the planet's forests is now easier. A frontier forest is a large, ecologically intact, and relatively undisturbed natural forest that would likely survive indefinitely without human assistance or interference. By comparing the way they were and the way they are now, we can better understand what is happening in all forests on Earth today.

The book provides a concise and authoritative description of frontier forests based on information and data from around the world. It was compiled using the latest techniques and with the assistance of the World Conservation Monitoring Centre and the World Wildlife Fund. It brings together all the relevant information on forests, presenting it in an easily understood text accompanied by maps and attractive and easily read charts and diagrams. Of special interest are the maps showing the threatened frontier forests of North America, South America, Africa, Europe and Russia, Asia, and Oceania. Each map outlines frontier forests under low or no threat, those under medium or high threat, and non-frontier forests (secondary and patches of primary forest not meeting this study's criteria as "frontier").

The book answers questions such as "What do we know about the world's forests?" and "Why do frontier forests matter?" It presents the results of the WRI's assessment of global frontier forests along with a description of the threats to these forests and their causes.

Findings point out that

- almost half of Earth's original forest cover is gone, much of it destroyed within the past three decades.

- Three countries—Russia, Canada, and Brazil—house almost 70 percent of the world's remaining frontier forest.

- Seventy-six countries assessed in this study have lost all of their frontier forests

This loss is attributed to logging, energy development, mining and new infrastructure, land clearing for agriculture, and other threats. Destruction is attributed to growing economies and consumption, population growth and demand for new land, bad economic policies, short-sighted political decisions, corruption and illegal trade, and poverty and landlessness.

There is much information provided but little more than a starting point is given for solutions. The problems of frontier forests cannot be solved in 42 pages, but this study goes a long way to educating us about them so we can make better-informed decisions.

This is an extremely useful book, not only for foresters and conservationists but also for a public that wants to know what has happened, is happening, and might happen to the remaining frontier forests.

John Whiting, President, Natural Heritage Consulting Inc.

Les enjeux de la biodiversité.

Par Catherine Aubertin et Franck-Dominique Vivien. 1998
Éditions Économica, Paris, 112 p., ISBN 2-7178-3492-3, 49 FF.

In five short and well-constructed chapters, the authors of this book present a rather critical view of the 1992 Convention on Biological Diversity signed in Rio; governed by economic interests, the implementation of the treaty seems to go against some of the objectives that it had first set out.

The Convention is, in fact, a compromise between the protection of business interests and the free access to resources and genetic information in the interest of the public good. It establishes the legal framework that will ensure the development of biotechnologies, and considers biological resources as just another commercial product.

This marketing of the living, according to the authors, is in keeping with the globalization of markets and the concentration of monopolies, but poses a threat to cultural diversity and the development of countries in the southern hemisphere. By concentrating on the identification of species which have commercial value, the bioprospection agreements could have a negative effect on our overall knowledge of biodiversity in these countries.

There is a contradiction between the way that intellectual property rights are treated in the Convention and the principle of the common heritage of mankind included in the International Undertaking on Plant Genetic Resources proposed by FAO in the early 1990s. The extension of patent laws to all living things, to which farmers in the south would have no say, threatens to make southern economies profoundly more dependant on the north. Indeed, the authors argue, the patenting of some living species could compromise the future of small rural communities by forcing them to grow patented species for export to the detriment of their own food crops. Above all, these small-time farmers, as well as the indigenous communities, must have the right to a decent living; this is possible only through the recognition of their land rights and of their rights as citizens. By exposing the consequences of biotechnologies and the extension of patents, developing countries will be able to defend their right to develop and to refuse to be dominated by the old imperialist powers.

This small but well-researched book puts a new light on the Convention on Biological Diversity, a way of looking at it that may scare certain naturalists. It's been five years since Rio; and it is time to face up to reality—we must recognize the shortcomings of this Convention and attack the problem head-on.

Jacques Prescott, Assistant Editor

Conservation Through Cultural Survival. Indigenous Peoples and Protected Areas,

Stan Stevens editor. 1997. Island Press, 320 pp. ISBN 1-55963-449-9. US \$22.95.

The world's largest remaining tropical forests and wetlands coincide with the embattled territories of indigenous peoples in Amazonia, southeast Asia, and circumpolar Canada and Russia. Cash-strapped governments continue to authorize mining and logging in officially protected ecosystems inhabited by indigenous peoples, such as the Orinoco watershed in Venezuela.

Conservation Through Cultural Survival takes the correspondence between reservoirs of cultural and biological diversity as its starting point. The authors aim to convince the reader that partnerships with indigenous peoples are good for conservation. As a student of indigenous knowledge systems and advocate for indigenous peoples' rights, I agree with the authors' proposition. But their case as presented here is not convincing.

The authors of *Conservation Through Cultural Survival* illustrate many ways that conservation groups and governments have adopted more inclusive, participatory policies in protected areas inhabited by indigenous peoples in Latin America, Australasia, Nepal, and the Arctic. Evidence of the ecological results is thin, however. And although indigenous peoples are increasingly recognised as the primary stewards of their ancestral territories, or as co-managers with governments and industry, there is as yet little evidence of genuine integration of indigenous knowledge systems with Western sciences.

Indeed, the authors fail to provide clear factual foundations for any of the legal, social, or ecological justifications they assert in support of indigenous stewardship. Nor do they refer to the international legal instrument that expressly recognizes the customary

stewardship and traditional knowledge of indigenous peoples, the *Convention on Biological Diversity*, which has now been ratified by three-fourths of the world's nation-states. Instead, they attribute all recent progress to environmental groups and the World Conservation Union (IUCN). This disregards the central role that indigenous peoples themselves have played in global environmental negotiations, and perpetuates the conceit that they must be saved by well-intentioned outside organizations.

Likewise, the authors contend at one point that indigenous peoples are passive, low-level consumers of resources, only to admit later that indigenous peoples have radically reshaped ecosystems to suit their needs.

The authors' ambivalence over indigenous peoples' interventionism hints at a confusion over the rationale for devolving managerial power to indigenous communities. Are indigenous peoples dependable stewards because they know how to reconfigure ecosystems, or because they never try? In my opinion, the most exciting research will involve recovering the prescriptions indigenous peoples have used historically to move ecosystems into new relatively stable equilibria—for example, by the periodic burning of forest understories.

As a source of alternative formulas for including indigenous peoples in the management of protected areas, *Conservation Through Cultural Survival* will undoubtedly become a deskbook for environment ministers under pressure to demonstrate sensitivity to indigenous peoples' concerns. With respect to the scientific and conservational results of collaboration with indigenous peoples, however, this book raises far more questions than it answers.

Russel Barsh is Associate Professor of Native American Studies at the University of Lethbridge. He participated in the United Nations Conference on Environment and Development as an adviser to the Indigenous Peoples caucus.

The Plundered Seas: Can the World's Fish be Saved?

Michael Berrill & David Suzuki. Sierra Club Books, 240 pp. ISBN 0871569450. US \$22.50.

How can supposedly rational beings repeatedly decimate some of the most abundant, resilient, and important natural resources on earth? It happened with the bison and the passenger pigeon, and it happens every day with other species that are less abundant and less important for human consumption. But still, on the grand scale presented in Michael Berrill's *The Plundered Seas*, it's hard to fathom.

The Plundered Seas tells the story of fisheries' booms and busts—a pattern repeated spatially (all over the world) and temporally (in the past, the present, and unless we change our fisheries management, in the future). You'd think we'd learn our lesson after repeated failures, but *The Plundered Seas* makes painfully clear the perverse logic that drives this crazy high-tech global tragedy. First, a new stock is discovered, the catch is good and profitable, and new fishers are drawn to the fishery. Operations expand, fishing pressure intensifies, and the fishery increasingly becomes depleted. Fishers invest in larger boats and better equipment, eventually overcapitalizing to try and win the race for fish. Finally, the fishery collapses, despite belated government efforts to regulate it.

While Berrill provides no earthshattering new information or ideas here, he pulls the whole dismal situation together in a readable, informative, and interesting book, a read that is somewhat cathartic. Here is someone telling it like it is: the current system of open access fisheries is a disaster; fisheries biology is inadequate and full of uncertainty; maximum sustainable yield has not worked; science is distorted or ignored for political expediency; greed, denial, lying, and cheating are widespread; the waste in bycatch is "colossal". These points are discussed individually, and reiterated in chapters on the collapse of

Georges and Grand Banks fisheries, straddling stocks and highly migratory tuna, salmon, and the Pacific coast of Asia. Oddly, throughout these discussions Berrill uses the word "harvest" to refer to fish catches, yet clearly what he is describing is not a harvest, in which a crop is gathered and the resources that supported that crop are left to sustain a future harvest. Perpetuating this euphemism only allows some fishers, managers, and biologists to remain in denial about current practices.

While the current situation appears bleak, Berrill's outlook is not. He outlines progress on international agreements such as the United Nation's Law of the Sea that may ultimately lead to solutions. Starting with an explicit assumption that open-access competitive fishing never works, he discusses alternatives such as co-management and individual transferable quotas. The discussions are brief for such complicated and contentious proposals, but thoughtful nonetheless. A significant omission in this list of potential solutions is greater use of marine reserves to allow protected stocks to replenish surrounding areas. Marine conservation biologists increasingly stress the importance of these areas for fisheries and ecosystem protection in general.

For those wanting to learn about global fisheries, *The Plundered Seas* is enjoyable and informative. And for all of us, it raises a very troubling question: If this is what we are doing to some of the most abundant and resilient natural resources on earth—resources that are a crucial food source for at least a billion people and the foundation for numerous economies around the world—what does that say about our stewardship capabilities for other life on earth?

Amy Mathews Amos, Program Director, Marine Conservation
Biology Institute, Arlington, VA

THE LAST WORD

The Rideau River—An Ecosystem to Discover

So much has been said about biodiversity. It remains a natural resource which is essential for our survival. We depend on it for food, drugs, clothes, energy, construction materials, pure air and our spiritual well-being. The environment must be considered an integral part of the economic and social health of its region and inhabitants. The management of the environment when it is considered as an ecosystem takes into account the complex interactions that occur between the living and non-living entities, including humans, and promotes multidisciplinary research and the collaboration of various stakeholders (governments, scientists, business interests and communities) so that the skills and the resources of each can be put to good use.

Over its one hundred kilometer course, the Rideau River, which flows from Smiths Falls to Ottawa, goes through urban and rural communities harbouring wetlands, parks and conservation areas. Can this ecosystem adapt itself to the pressures exerted by ever-increasing human activities?

To answer this concern, the Canadian Museum of Nature has undertaken a three-year study of the biodiversity of the Rideau River. The aim of this study is to establish partnerships between scientists, residents and representatives of local, regional, provincial and federal organizations in order to evaluate the ecological health of the Rideau River and to reconcile the local needs with the long-term viable management of biodiversity.

The members of the scientific team, who are specialized in taxonomy and ecology, will analyze the changes that occur in biodiversity both naturally and due to human activity. They will do this by studying seven biotic components: phytoplankton and water chemistry, aquatic plants, mollusks, amphibians, reptiles, fish, and aquatic birds.

In order to insure the participation of local communities, the Museum team, together with the Rideau Valley Conservation Authority, have set up two community advisory panels whose members will be drawn from different backgrounds (business, agriculture, tourism, recreational activities, education, and others). The two panels will determine the local concerns about the environmental health of the river, pool their knowledge of the region, submit results of the study to the community, and recommend remedial measures to the local authorities.

This kind of management of environmental changes—which promotes a multidisciplinary and multilateral involvement—should help us make our rivers cleaner and more biologically diverse, and should allow us to use them in a sustainable way that takes into account the economic needs and the social values of the region. We hope that these partnerships and the community involvement in the solving of scientific problems will serve as a model to other groups that have similar objectives across Canada.

Michel Poulin

Research Scientist

Canadian Museum of Nature

A few words about the Canadian Museum of Nature

The origins of the Canadian Museum of Nature (CMN) were formed within the Geological Survey of Canada in 1842.

Over 150 years later, the CMN has some 10 million specimens in its collection, which still represents only half the known species in this country, and an active team of scientists, collection managers, education specialists, and business experts.

The CMN's mandate is to increase knowledge and understanding of, appreciation and respect for, and interest in the natural world. This role has never been more crucial, as the demand for environmental harmony between the world's burgeoning human population and nature reaches a critical point. For more information about the Museum's activities, please contact Joanne Charette, Corporate Communications at (613) 566-4249.

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A Report of the 6th Global Biodiversity Forum, (1998). Eds. Sheldon Cohen & Stanley W. Burgiel. The proceedings of the 6th Global Biodiversity Forum, included here in Spanish and English, document progress being made in the science and policy of applying national-level biodiversity indicators and targets to national reporting requirements of the Convention on Biological Diversity. Publishers: Biodiversity Action Network (BIONET) & IUCN. For copies contact: Juliette Moussa, BIONET, 1400 16th Street, NW-Suite 502, Washington, D.C. 20036; Tel: (202) 547.8902; E-mail: bionet@igc.org

Selection Management of Private Woodlands in Nova Scotia:

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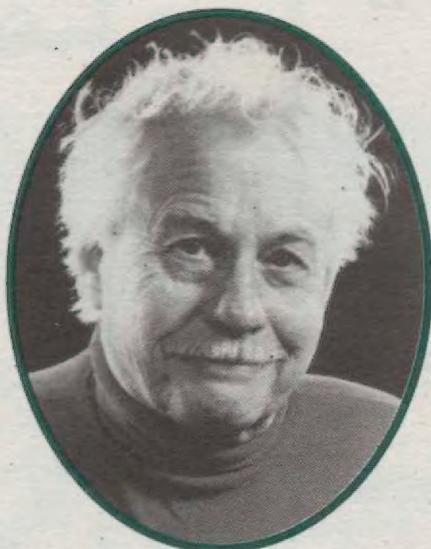
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Tribute to W.O. Mitchell

W. O. Mitchell, one of Canada's most beloved writers, died 25 February 1998 at the age of 83. Born in Weyburn, Saskatchewan, on the Canadian prairies, most of his stories and radio plays involved prairie people and landscapes. By the powers of their pen and creativity, authors of fiction, unbound by the strictures of science, are often able to evoke both the tiny details of nature's cosmos and the wholeness of the environment. Mitchell was a master of this form.

"As cloud's slow shadows melt across the prairie's face, more nights slip darkness over. Light, then dark, then light again. Day then night, then day again. A meadow lark sings and it is spring. And summer comes.

A year is done.

Another comes and it is done.

Where spindling poplars lift their dusty leaves and wild sunflowers stare, the gravestones stand among the prairie grasses. Over them a rapt and endless silence lies. The soil is rich.

Here to the West a small dog's skeleton lies, its rib bones clutching emptiness. Crawling in and out of the teeth an ant casts about; it disappears into an eyesocket, reappears to begin a long pilgrimage down the backbone spools.

The wind turns in a silent frenzy upon itself, whirling into a smoking funnel, breathing up topsoil and tumbleweed skeletons to carry them on its spinning way over the prairie, out and out to the far line of the sky."

W.O. Mitchell,
Who Has Seen the Wind (1947)

The goals of Global biodiversity are to:

- Publish articles, views, and news on biodiversity
- Bridge the gaps between professional disciplines & the public
- Communicate vital information to help humankind make decisions on the fate of the Earth's life
- Express views on the needs & value of biodiversity research
- Provide an international forum for discussing issues on biodiversity
- Enhance awareness of the role of biosystematic research & museum collections to conservation & ecologically sustainable use of biodiversity
- Discuss methods and philosophy of biodiversity conservation
- Review books and periodicals on biodiversity

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